

Summer of Seasons  
*Workshop Program for Emerging Educators in Earth System Science*



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Submitted by:

S. Raj Chaudhury  
Principal Investigator  
Director, BEST Lab & Associate Prof. of Physics

Norfolk State University  
700 Park Avenue,  
Norfolk, VA 23504, USA

## ABSTRACT

Norfolk State University's BEST Lab successfully hosted three *Summer of Seasons* programs from 1998-2001 funded under the NASA NRA 96-MTPE-07. The *Summer of Seasons* program combined activities during the summer with additional seminars and workshops to provide broad outreach in the number of students and teachers who participated. Lessons learned from the each of the first two years of this project were incorporated into the design of the final year's activities. The "Summer of Seasons" workshop program provided emerging educators with the familiarity and knowledge to utilize in the classroom curriculum materials developed through NASA sponsorship on Earth System Science. A special emphasis was placed on the use of advanced technologies to dispel the commonly held misconceptions regarding seasonal, climactic and global change phenomena.

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## 1. INTRODUCTION

Norfolk State University enrolls the largest number of African American teacher candidates in the nation. The preparation of future educators is an important part of the nation's science education enterprise. With proper training, teachers can effect positive changes in the way children view the real world. The attitudes of children towards science are directly related to the science attitudes of their teachers. A fear of science or teacher lack of confidence in science ability can neglect the development of those same skills in their students. The study of global climate change offers many opportunities to engage students in the pursuit of science and allows University faculty a contextual basis for teacher preparation programs.

Norfolk State University has established a science education research and curriculum development effort through the B.E.S.T. Lab (Bringing Education and Science Together). This laboratory serves as a multimedia learning center for in-service and pre-service teachers who have an interest in science education. A variety of NASA funded resources have been collected at the BEST Lab, which offers a supportive environment for technology-enhanced learning. Science faculty, education faculty, graduate students (education) and undergraduate students (Physics, Chemistry, Computer Science) work side by side in BEST Lab projects.

The *Summer of Seasons* project has benefited from the ongoing, simultaneous activities in projects such as REESS (Research Experience in Earth System Science), BEST STEPS (Bringing Education & Science Together for Systemic Training and Enhancement of Preservice Students) and MiLENNIUM (Mission Leveraged Education: NASA/NSU Innovative Undergraduate Model). These are all NASA funded projects.

## 2. MOTIVATION

The striking video "A Private Universe" [Annenberg/CPB 1992] documents a widely held misconception about our global environment. Students emerging from Harvard University graduation ceremonies were asked what causes the change in seasons from summer to winter. The overwhelming majority believed it was warmer in the summer because the earth was closer to the sun and colder in the winter because the earth was further away. One could easily imagine students in a variety of educational settings holding similar 'folk' views of seasonal changes. The scientific research programs supported by NASA's Earth Science Enterprise provide knowledge that could help dispel these and other incorrect views of our environment. Remote sensing data from satellites give information on surface temperature, solar irradiance, aerosol and water vapor concentration, cloud cover, polar ice cap size and other parameters that contribute to our climate. Even though much of this data is now publicly available via the Internet, the methods of accessing and analyzing it are not widely understood outside the research community.



### 3. RESULTS

#### 3.1 Project Goals and Objectives

- I. Introduce the scientific method of inquiry
- II. Explore common misconceptions regarding the cause of change in seasons
- III. Introduce and reinforce computer skills in the use of the CD ROMS for scientific purposes
- IV. Provide on access to Mission to Planet Earth data sets from NASA's Distributed Active Archive Centers (DAAC)
- V. Introduce the use of digital sensors connected to computers or graphing calculators for laboratory data acquisition
- VI. Provide training on the use of image processing and scientific visualization software appropriate for the classroom.
- VII. Use multiple avenues to promote the use of NASA funded Earth System Science educational materials in the classroom

#### 3.2 Summer of Seasons Activities

The "Summer of Seasons" (SoS) project derives its name from the misconceptions described in the Section 2 above. In Year 1 of this project, a daylong series of seminars and workshops was held as kick-off for a formal, intensive training workshop with a limited number of participants. That event was called "BEST Fest". Following on the success of that event, a strategy was adopted for execution of the project in Year 2 and Year 3 that included:

- An intensive week-long workshop in 2001 for 24 pre-service and in-service teachers
- an expanded BEST Fest,
- multiple shorter training events with diverse populations
- dissemination through systemic initiatives in teacher preparation that are ongoing in the state of Virginia (VCEPT – Virginia Collaborative for Excellence in Preparation of Teachers)
- dissemination and training for those involved in an informal science education program – the CHROME clubs (Cooperating Hampton Roads Organization for Minorities in Engineering), which had received funding from NASA MURED division



Teacher candidates were recruited from the 150 Norfolk State University student teachers currently completing their fieldwork. In addition, a flyer and a letter were mailed to the science and mathematics supervisors for both elementary and high school grades in 5 local school systems. Additional promotion of the project activities came through announcements in several education courses at Norfolk State University. Finally, the PI for this project, Dr. S. Raj

Chaudhury (Physics) and co-I Dr. Gae Golembiewski (Education) were invited by NASA Earth Science Enterprise to participate in their booth at the NSTA National Meetings in Las Vegas (1998), Boston (1999), St. Louis (2001) which provided additional opportunities to publicize the project and encourage teachers from the Hampton Roads area to attend.

A two day BEST FEST was scheduled at the end of September 1999, which fell at the early portion of the schedule of the Student Teaching Seminar. Presentations were made to the August training seminars to recruit students who felt they needed to learn more about Earth Science before they finished their undergraduate or graduate program. During BEST Fest, seminars were offered at different sites on the Norfolk State University campus to provide lab space for experimentation (picture above right), a classroom simulation atmosphere to demonstrate science lessons by expert classroom role models, and technology labs with multi-media equipment.



BEST FEST was planned for student teachers the first day and for in-service teachers the second day. Based on our experience from the first year of Summer of Seasons, it was decided that the 1999 program should have additional hands-on activities that spoke more to the needs of elementary teachers and addressed areas such as the life sciences which had not been the focus of the first year's activities. The picture above shows two participants working on an activity that complemented the computer-based graphical visualization of satellite data that was the focus of several of the other BEST Fest workshops.

At the BEST Fest activities in 1998 and 1999, Ms. Elizabeth Smith from Old Dominion University presented the classroom modules in oceanography that she is developing in concert with the NASA Goddard-based SEES project (Studying Earth's Environment from Space). Ms. Smith and her collaborators are developing undergraduate-level courseware that emphasize inquiry learning, graphical data analysis of oceanographic remote sensing data and are appropriate for use in a laboratory setting. Students who were participating in the REESS undergraduate summer research program that was concurrent with the 1998 workshop (some being mentored by Ms. Smith) also participated in BEST Fest activities. Some presented their current research projects and were able to demonstrate their technical knowledge to teachers.

At the week-long workshop in 2001, Dr. Chaudhury and Dr. Golembiewski were assisted by NSU graduate students and undergraduate science majors. The graduate students were John Ippolito (Master of Arts in Teaching Physics) and Audra Chambers (Master of Arts in Teaching Biology). Presenting a lesson on Acid Rain were Nicole Burt (then a Biology major, now a candidate for a Master's degree in Teaching Biology) and Kerry Lee (then a Biology major, now a graduate student at Old Dominion University). Three faculty members (2 from NSU and 1 from Hampton University) also attended the 2001 workshop. A number of the participants in 2001 are sponsors of CHROME clubs (Cooperating Hampton Roads Organization for Minorities in Engineering) and thus it is expected that further dissemination of NASA educational materials will occur in these informal science clubs with K-12 students.

Participants in the 2001 workshop worked in groups of 3 or 4 to create lesson plans in Microsoft Powerpoint that were shared with the entire group on the last day of the workshop. All the products from the workshop were put on CD-ROM and copies given to each workshop attendee. Dr. Chaudhury put together a short digital video featuring highlights of the workshop and this was provided on the CD-ROM as well.

### *3.3 Final Outcomes*

Over the three years of Summer of Seasons activities, the project impacted well over a hundred pre-service and in-service teachers. In addition, there was a multiplier effect from this project as the pre-service teachers who were employed in the BEST Lab go out and work with their own classes. As expected, the project did effect a wider dissemination of curricular products developed for Earth System Science education. The student teachers and classroom teachers were almost unanimous in their high rating of each of the workshop sessions and the overall positive effect of the content-rich and pedagogy-centered approach, especially for those teachers for whom science and educational technology is not a strong point.

For instance, in 1999, twenty-one out of twenty-three students in attendance during the first day rated the BEST FEST at a level five (on a scale of one to five with five as the highest rating) on three categories; quality of the presentation, benefit to the level of professional development, and eagerness to attend a similar scheduled event next year. When the student teachers went back to their respective schools to tell of their positive feelings about the BEST FEST, a number of last minute registrations were phoned in by principals who had called in substitute teachers so more of their teachers could attend the second day of workshops.

In 2001, the third and final workshop was held with approximately 24 participants. The great majority of participants rated quality of presentations, benefit to professional development and impact on ability to teach earth science topics as very high.

In conclusion, Summer of Seasons project achieved its goals and objectives.

## **4. Facilities and Resources**

The facilities of the BEST Lab and other resources within the School of Science & Technology were available for use by project participants in Year 3. The Lab has been designated as a Center of Excellence by the University – the PI of this project, Dr. Chaudhury, is the Director of the Lab and reports directly to the Dean of the School on matters relating to funded projects operating through the BEST Lab. It continues to house several Macintosh computers (G3 or equivalent) and Pentium-based Windows machines. In addition, educational software and CD-ROMs culled from NASA resources and purchased through the grant were made available to the project participants. Fast network connections (100 Mbps) are provided by the University for no additional cost to the project and will continue to be maintained.

The BEST Lab has been expanded to now include three separate facilities which have been available to project participants: the Curriculum & Instruction Center (CIC); the Scientific

Visualization Center which houses NSU's Onyx2 supercomputer and Immersadesk Virtual Reality system and the Instrumentation Center. A web site at <http://vigyan.nsu.edu/bestlab> has been used for dissemination of information regarding the project.

#### *4.1 Faculty Expertise*

The Principal Investigator for this project, Dr. Chaudhury, is an Associate Professor of Physics at Norfolk State University. He brings expertise in physics education research, undergraduate course reform, technology innovations for enhanced learning and project management to this endeavor. He has served as an evaluator for NASA curriculum development projects, has served as a consultant to NASA Office of Space Science on education and public outreach and was served on the Advisory Board for the NSF-funded Center for Learning Technologies in Urban Schools (Northwestern University and University of Michigan). The BEST Lab at NSU, of which Dr. Chaudhury is the director, has been designated a Center of Excellence by the university and continues to play a prominent role in science education reform efforts on campus. Dr. Chaudhury is also co-Investigator on NSU's Digital Earth project under the 1999 Earth Science Enterprise NRA.

The Lead Instructor, Dr. Gae Golembiewski has extensive experience with the integration of science and technology for gifted populations in elementary and middle school classrooms. She is an Associate Professor in the Department of Special Education and coordinator of the Master's program in Gifted Education at Norfolk State University. She has presented numerous workshops nationally and internationally to pre-service and in-service teachers on the use of technology for teaching including CD-ROM based materials on Earth System Science.

### **5. BUDGET**

A detailed budget, with line item costs shown, had been approved by NASA for each year of this project. In each year, every effort has been made in creating the budget to maximize funds available for purchase of educational materials for the workshop participants. 50% summer salary for 1 month was requested for both Drs. Chaudhury and Golembiewski. This helped cover the time spent organizing the workshops in addition to actual instruction. To assist with program logistics, a graduate student was supported part time during the project. This person assisted Drs. Chaudhury and Golembiewski in the organizational details as well as the hands-on activities. In addition, the graduate student helped complete the internal evaluation of the project by distributing, scoring and synthesizing questionnaires. Participation in the NASA Earth Science Enterprise booth at the NSTA National Meeting has become an integral part of our efforts. Partial support for NSU's attendance at these meetings was provided by this grant.

Substantial funds have been expended to ensure that each educator leaves with a classroom copy of text materials, posters, videos, CD-ROMs and software either from NASA CORE or other commercial and university sources. The project hosted several BEST Lab receptions for recruiting purposes and lunch was served on each workshop day. Providing lunch encourages workshop participants to continue discussions that were started during the session and enhanced the contact between in-service teachers and pre-service students.

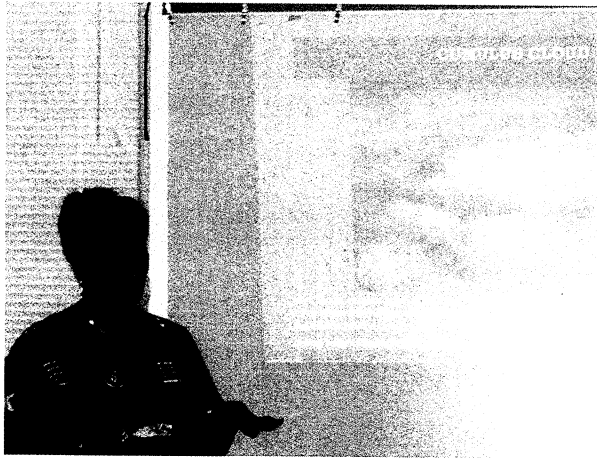




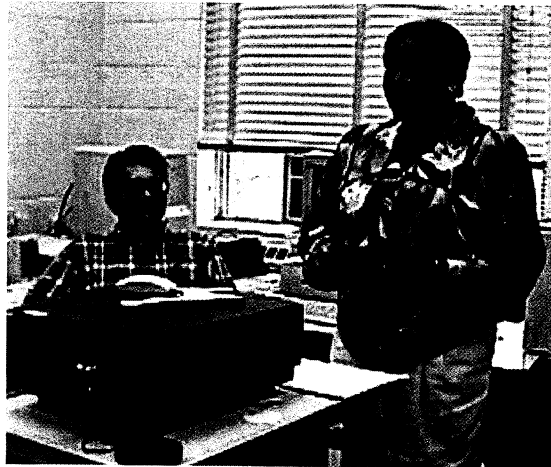
Participants in Summer 2001 workshop



Presenting at NSTA in San Diego, 2002



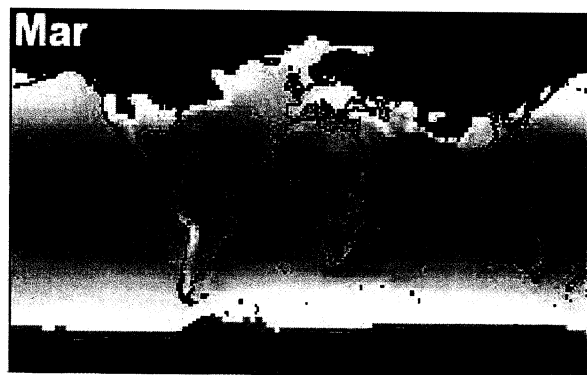
Final participant presentation, 2001



Final participant presentation, 1998



Participants show off their work, 2001



Global Monthly Temperature distribution  
visualization of satellite data